No. 793,897. PATENTED JULY 4, 1905.

R. G. McFARLAND.

ELECTRIC SWITCH SYSTEM FOR BLAST FURNACES.

APPLICATION FILED NOV. 10, 1904.

2 SHEETS—SHEET 1.

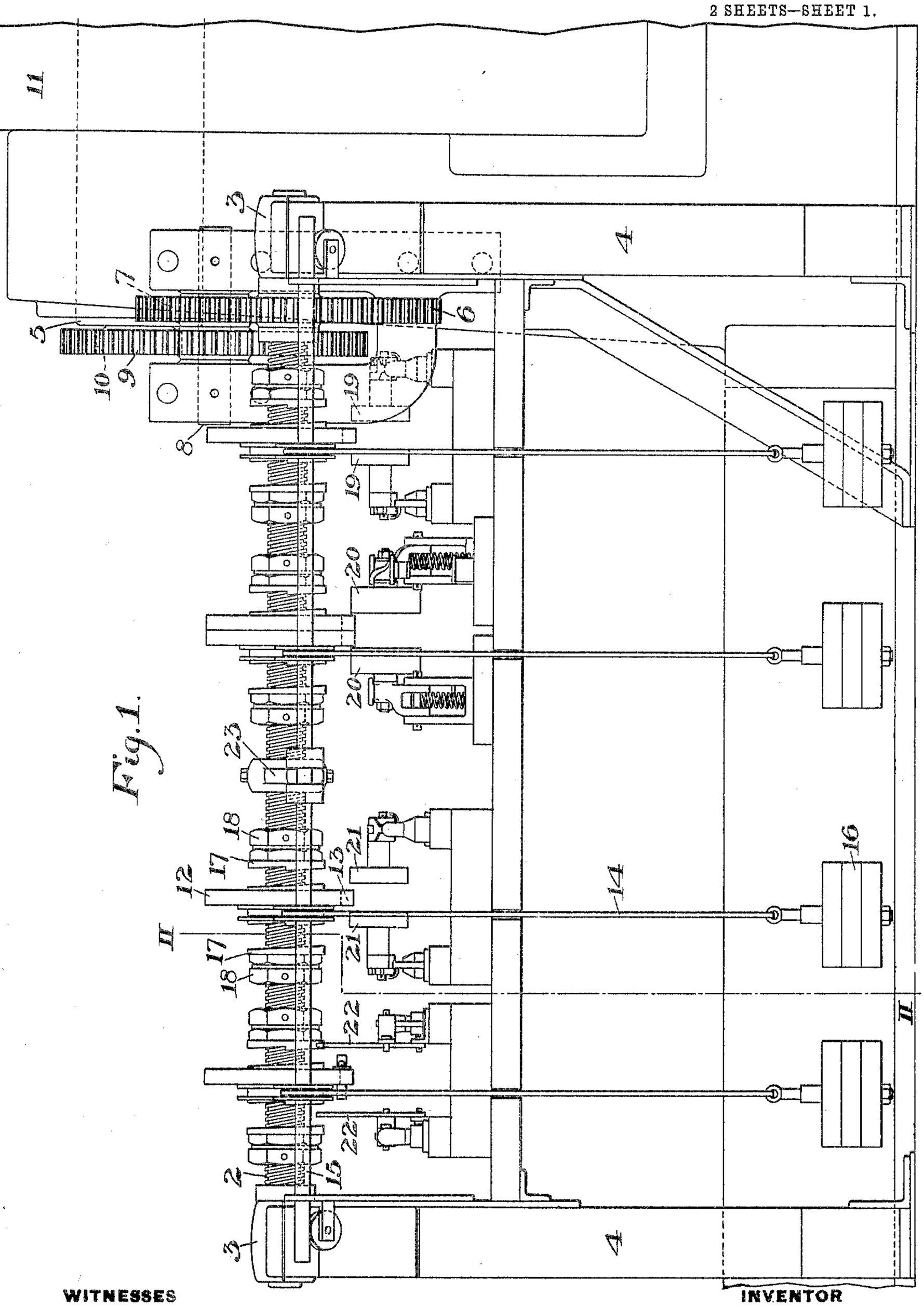


Fig. 1.

WITNESSES

Warren W. Swartz

H. N. Conwin

INVENTOR

Robert G. McFarland

by Barnes & Symes

his attys

No. 793,897. PATENTED JULY 4, 1905.

R. G. McFARLAND.

ELECTRIC SWITCH SYSTEM FOR BLAST FURNACES.

APPLICATION FILED NOV. 10, 1904.

2 SHEETS—SHEET 2.

Fig. 3.

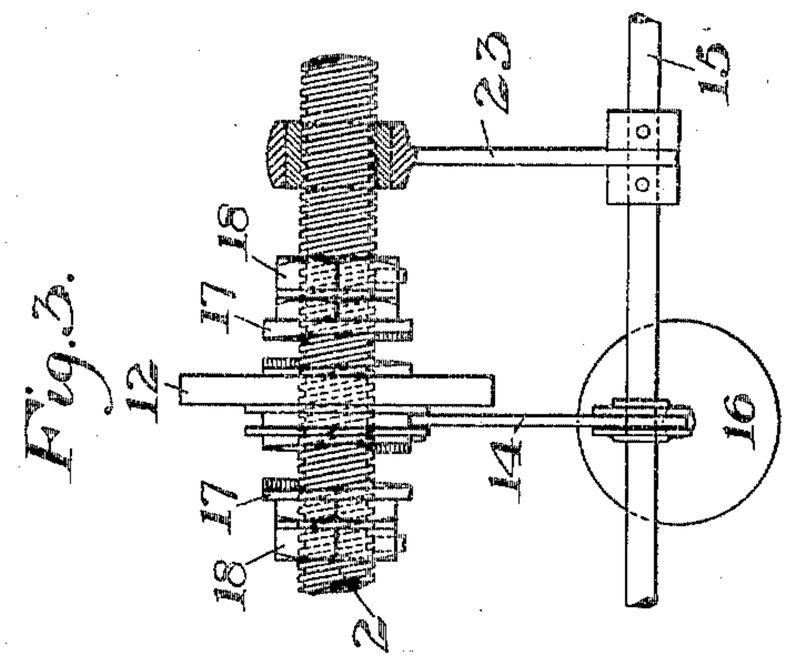


Fig. 4.

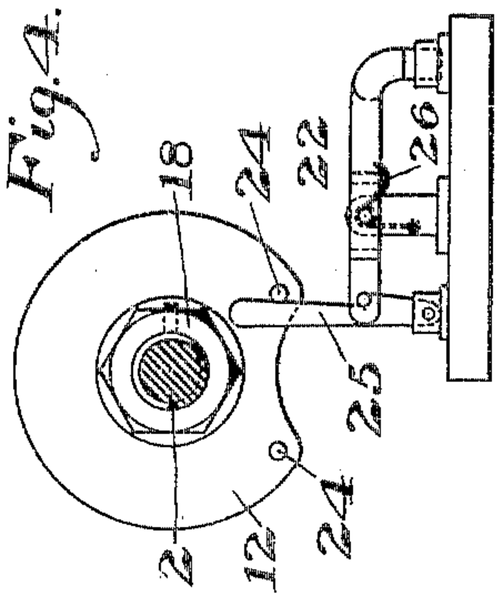
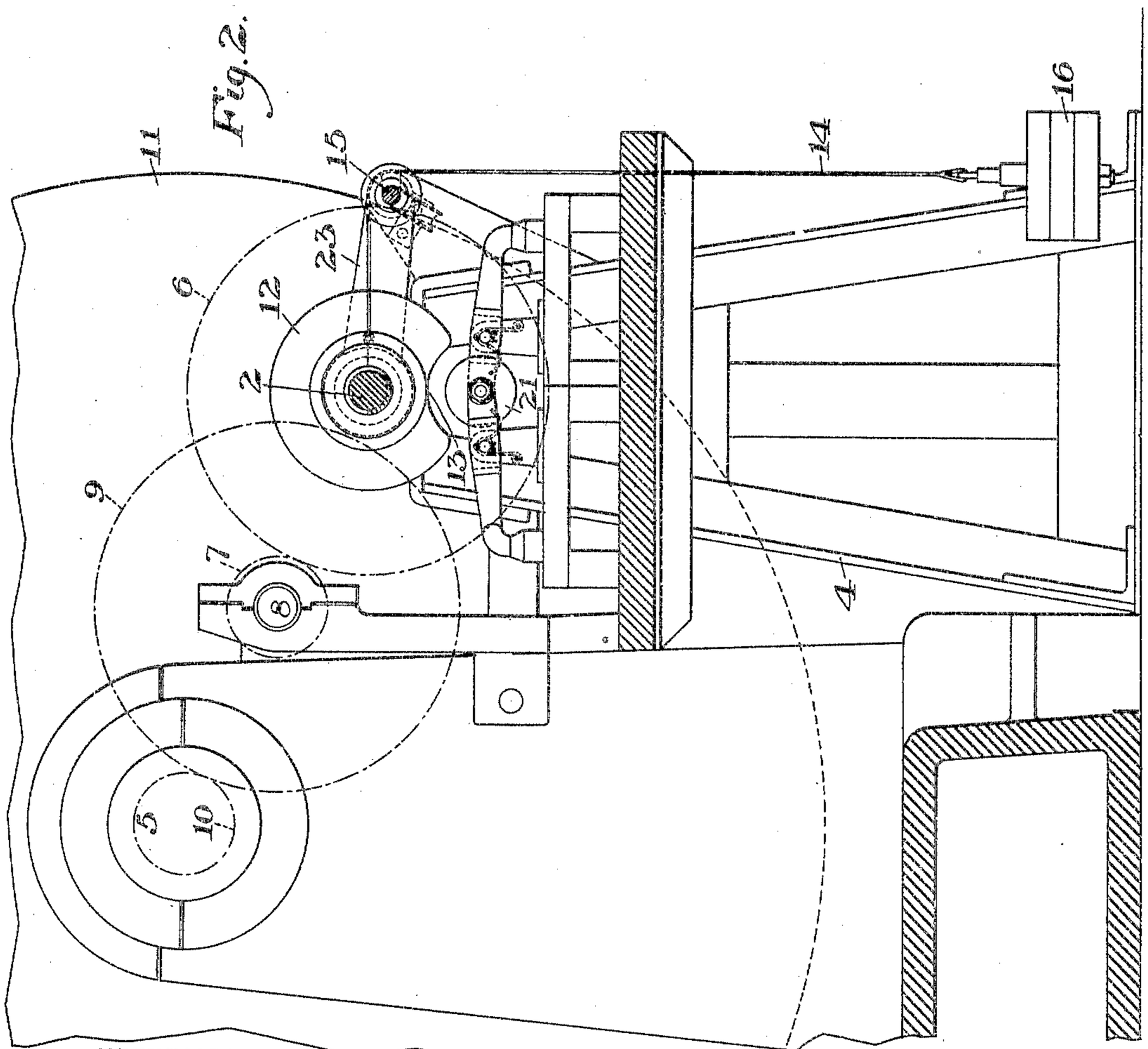


Fig. 2.



WITNESSES

Warren W. Swartz

H. M. Corwin

INVENTOR

Robert G. McFarland

by Barlow & Haynes

his attys

No. 793,897. Patented July 4, 1905.

UNITED STATES PATENT OFFICE.

ROBERT G. McFARLAND, OF NEWCASTLE, PENNSYLVANIA.

ELECTRIC SWITCH SYSTEM FOR BLAST-FURNACES.

SPECIFICATION forming part of Letters Patent No. 793,897, dated July 4, 1905.

Application filed November 10, 1904. Serial No. 232,201.

To all whom it may concern:

Be it known that I, ROBERT G. McFARLAND, of Newcastle, Lawrence county, Pennsylvania, have invented a new and useful Electric Switch System for Blast-Furnaces, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a front elevation of my improved switch device applied to the jack-shaft of a winding-drum. Fig. 2 is a cross-section showing the gearing connections diagrammatically. Fig. 3 is a partial plan view, and Fig. 4 is a detail view, showing one of the limit-switches.

My invention relates to the safety electric switch systems for blast-furnace hoists.

In modern top-filling apparatus for blast-furnaces the skip which travels on the inclined track is actuated by winding-drums driven by electric motors controlled by suitable switch devices. In the present system the main operating switch devices are located on an oscillating or tilting arm which moves during the rotation of the winding-drum and actuates the speed, slow-down, stop, and limit switches. In order to prevent accidents in case this switch system works incorrectly, a supplemental or safety switch system is used on single-skip hoists in conjunction with the weight which counterbalances the skip. This weight is mounted in a tower, and as it is raised and lowered it actuates the several switches in unison with the main switching apparatus. Such a system presents many disadvantages. The safety-switches are difficult of access and exposed to snow and ice and also to blow-outs of the furnace. The system is not within the sight of the engineer in the engine-room and is very liable to get out of order, especially as the rope connecting to the counterweight stretches and destroys the proper timing of the switches. My invention overcomes these difficulties and provides a switch-operating system which may be located within the engine-room close to the winding-drum and under the observation of the engineer. The device is driven directly by gearing connections, is small and compact, and enables a separate adjustment to be given to each switch.

In the drawings, 2 represents the main screw-shaft of my apparatus, this being mounted in suitable bearings 3 3 in end frames or support 4. The shaft is geared to the jack-shaft 5 of the winding-drum by a toothed wheel 6 on the screw-shaft engaging a pinion 7 on the idler-shaft 8, having a toothed wheel 9 intermeshing with a pinion 10 on the jack-shaft.

11 represents the winding-drum, which is driven through a suitable internal gearing in the ordinary manner. The slow-motion connections shown and described turn the shaft 2 at a slow rate of speed whenever the winding-drum is turned and in a direction corresponding to that of the winding-drum. Each of the switch-actuating devices on this worm or screw shaft consists of a clutch device made in two parts, one part being clamped or rigidly secured to the shaft, while the other part is screw-threaded and held in position to travel along the shaft until it engages the fixed half and turns with the shaft to operate the switch. Thus, for example, the stop-switch consists of two general parts—namely, the disk 12, having a cut-out portion 13 upon one edge, which is arranged to move over the roller on the switch-lever, this disk being secured to a screw-sleeve engaging the screw-shaft 2. To hold the disk in correct angular position on the shaft, I connect the sprocket chain or rope 14 to it, this extending over a guide-pulley on shaft 15 and down to a weight 16. The other half of the clutch device consists of a clutch member 17, clamped on the shaft by a clamping-nut 18. When the shaft is turned in the proper direction, the one half of the clutch member will of course travel along the shaft slowly until its crab-clutch face engages the corresponding face of the clutch member fixed to the shaft. The disk will then turn with the shaft, and in turning its cam or notched portion will move over and actuate the switch and hold it. In order to properly move the switches during the travel of the skip both upwardly and downwardly, I duplicate the clutch members 17, which are fixed to the screw-shaft on each side of the traveling disk member, so that each

entire clutch device really consists of three parts—namely, two corresponding clutch members fixed to the shaft and a traveling clutch member movable longitudinally between them. Each of the clutch devices is of the same general nature, and I have shown four of these devices to operate the duplicate switches 19, 20, 21, and 22. 19 is the speed-switch, 20 is the slow-down switch, 21 the stop-switch, and 22 the limit-switch. Each switch is in duplicate, one arm working during the upward movement of the skip, the other during the downward movement. In order to keep the connections 14 in alinement, I preferably move the shaft 15 endwise by the screw-arm 23, secured to the shaft 15.

In the operation of the device as the skip moves toward the upper limit of its travel the movable portion of the speed-switch will engage its clutch device at the right and turn with the shaft to slow down the speed. Near the end of the travel of the skip the slow-down switch will operate correspondingly, and when the skip has reached the desired point the stop-switch will come into action. If the stop-switch fails to act for any reason and the skip travels beyond a fixed distance, the limit-switch will act and cut off all current. As shown in Figs. 1 and 4, the limit-switch is arranged to give a quick action, the clutch member having pins 24, arranged to engage a trigger 25, which normally holds the switch closed. A spring 26 tends to open the switch, and as soon as the pin 24 on the limit-switch actuates the trigger 25 to release the switch, it is quickly snapped open. In the downward movement of the skip the switches will be correspondingly actuated in the reverse order.

The advantages of my invention result from the simplicity of the device and its positive action. It is directly under the observation of the engineer and within easy reach. Each switch-operating device can be adjusted independently of the others, and being small and compact the device can be placed in the engine-room. The apparatus may be used either as a main switch-operating device or a safety device, and many changes may be made in the form and arrangement of the parts without departing from my invention.

I claim—

1. In a switch-operating device for hoists, a rotary screw-shaft arranged to rotate simultaneously with the winding-drum, and having slow-motion gearing connection therewith, a plurality of screw-sleeve members movable along the shaft, and electrical switches arranged to be operated by the screw-sleeve members, at least one of said switches being a limit-switch; substantially as described.

2. In a switch-operating device for hoists, a screw-shaft, and mechanisms thereon arranged to operate a series of switches, each mechanism being adjustable independently of the others; substantially as described.

3. In a switch-operating device for hoists, a rotary shaft arranged to rotate simultaneously with the winding-drum, screw-sleeve members movable along the shaft, clutch members arranged to interlock with the screw-sleeve members, and electric switches arranged to be operated by the screw-sleeve members when so locked; substantially as described.

4. In a switch-operating device for hoists, a screw-shaft, screw-sleeve members arranged to travel along said shaft, means for normally holding said members against rotation, adjustable clutch members secured to the shaft and arranged to lock the screw-sleeve members and turn them, and switches arranged to be held in position and actuated by the screw-sleeve members when so locked; substantially as described.

5. In a switch-operating device for hoists, a rotary shaft arranged to rotate simultaneously with the winding-drum, screw-sleeve members movable along the shaft, clutch members arranged to interlock with the screw-sleeve members, and electric switches arranged to be operated by the screw-sleeve members when so locked, at least one of said switches being a limit-switch; substantially as described.

6. In a switch-operating device for hoists, a screw-shaft, a switch-operating device carried thereby, a spring-actuated limit-switch having a latch or trigger arranged to be engaged by said operating device; and a hoisting-drum having slow-motion gearing connected to the screw-shaft substantially as described.

In testimony whereof I have hereunto set my hand.

ROBERT G. McFARLAND.

Witnesses:

E. A. Spires,

C. C. Cooper.